CLAIMS

1. A remotely actuated gas lift system for lifting oil for use with a production tube positioned inside a well casing with a plurality of manifolds in the production tube spaced apart from each other along the production tube; the gas lift system comprising:

a plurality of valve assemblies configured to be mounted on the plurality of manifolds, wherein each of the plurality of valve assemblies defines an open position that permits flow between the production tube and the well casing through an individual manifold and a closed position that blocks flow between the production tube and the well casing at each individual manifold; each of the plurality of valve assemblies comprising:

a valve body containing a valve;

a coupling means for connecting the valve to one of the plurality of manifolds;

a biasing device that generates a biasing force that biases the valve towards the closed position;

a valve piston positioned within a control fluid chamber within the valve body, wherein pressurizing the control fluid chamber with a control fluid generates a force that acts against the biasing force of the biasing device;

a first inlet fluidly coupled to the control fluid chamber; and

a mounting body rotatably coupled to the valve body, wherein the mounting body comprises a second inlet in fluid communication with the first inlet and wherein the valve body extends through the mounting body;

a control line containing the control fluid, wherein the control line is coupled to the control fluid chamber in each of the plurality of valve assemblies at the second inlet at each mounting body; and

a means to selectively control the pressure of the control fluid in the control line;

wherein each of the individual valve assemblies is configured with biasing devices having different biasing forces in each valve, with a topmost valve having a highest biasing

force and each sequentially lower valve having a lower biasing force with a lowest most valve having a lowest biasing force.

2. The system of claim 1, wherein the first inlet is rotatable relative to the second inlet.

3. The system of claim 1, wherein the biasing device is a spring.

4. The system of claim 1, wherein the biasing device comprising a Belleville washer.

5. The system of claim 1, further comprising a means to adjust the biasing force generated by the biasing device.

6. The system of claim 5, wherein the means to adjust the biasing force is a force adjusting screw.

7. The system of claim 1, wherein each of the plurality of valve assemblies is adapted to operate bi-directionally, such that compressed natural gas (CNG) can be injected into either the production tube or within the well casing outside of the production tube without reconfiguring the valve assemblies.

8. The system of claim 1, further comprising:

a pressure sensor that detects a pressure of compressed natural gas (CNG) injected into either the production tube or within the well casing outside of the production tube;

a controller that controls the means to selectively control the pressure of the control fluid in the control line, wherein the controller is programmed to incrementally lower the pressure of the control fluid based on the measured pressure of the CNG.

9. The system of claim 1, wherein each of the plurality of valve assemblies further comprises:

a valve seat;

a valve member that is movable within the valve body relative to the valve seat, wherein the position of the valve member relative to the valve seat defines an adjustable restriction to fluid flow through the valve body, wherein the biasing device pushes the valve member in a first direction that reduces fluid flow through the valve body and wherein the force generated

by pressurizing the control fluid chamber with the control fluid pushes the valve member in a second direction that increases fluid flow through the valve body.

10. A method of operating the system of claim 1 comprising:

configuring each of the plurality of valve assemblies with biasing devices configured with different biasing forces;

organizing the plurality of valve assemblies in order of decreasing biasing forces;

coupling each of the plurality of valve assemblies on individual manifolds with the valve assembly having the highest biasing force coupled to the topmost manifold and each sequentially lower valve assembly having a lower biasing force;

connecting the control line to each of the plurality of valve assemblies and the means to control the pressure of the control fluid;

positioning the production tube inside the well casing;

with liquid filling both the production tube and the well casing, setting the pressure of the control fluid to a pressure greater than required to move each of the plurality of valve assemblies to the open position;

with liquid filling both the production tube and the well casing, injecting compressed natural gas (CNG) into one of the production tube or the well casing;

determining when the CNG has displaced sufficient liquid in the production tube or well casing for the CNG to reach the valve assembly positioned directly below the topmost valve assembly at which point closing the topmost valve by reducing the pressure of the control fluid below the pressure where the topmost valve assembly closes but keeping the pressure above the pressure where the valve assembly positioned directly below the topmost valve assembly opens.

11. A valve for use in a remotely actuated gas lift system for use with a production tube positioned inside a well casing with a plurality of manifolds in the production tube spaced apart from each other along the production tube, wherein the valve is controlled using a control line positioned inside the well casing, wherein the control line carries a control fluid; the valve comprising:

a valve body defining a first inlet;

a valve seat;

a valve member that is movable within the valve body relative to the valve seat, wherein the position of the valve member relative to the valve seat defines an adjustable restriction to fluid flow through the valve body;

a mounting body rotatably coupled to the valve body, wherein the mounting body defines a second inlet in fluid communication with the first inlet and wherein the valve body extends through the mounting body and wherein the second inlet is adapted to fluidly couple to the control line;

a coupling means for connecting the valve body to one of the plurality of manifolds;

a biasing device that generates a biasing force that pushes the valve member in a first direction that reduces fluid flow through the valve body; and

a valve piston positioned within a control fluid chamber within the valve, wherein the control fluid chamber is in fluid communication with the first inlet, and wherein increasing pressure of a control fluid in the control fluid chamber pushes the valve member in a second direction that increases fluid flow through the valve body.

12. The valve of claim 11, wherein the first inlet is rotatable relative to the second inlet.

13. The valve of claim 11, wherein the mounting body further comprises an outlet adapted to couple the control line to another valve.

14. The valve of claim 13, wherein the outlet is rotatable relative to the valve body.

15. The valve of claim 11, wherein the valve is adapted to operate bi-directionally, such that compressed natural gas (CNG) can be injected into either the production tube or within the well casing outside of the production tube without reconfiguring the valve.

16. A method of operating a remotely actuated gas lift system using the valve of claim 11, the method comprising:

providing a plurality of valves of the valve of claim 11;

coupling each of the plurality of valves on individual manifolds

connecting the control line to each of the plurality of valves and a means to control the pressure of the control fluid;

positioning the production tube inside the well casing;

with liquid filling both the production tube and the well casing, setting the pressure of the control fluid to a pressure greater than required to move each of the plurality of valves to the open position;

with liquid filling both the production tube and the well casing, inject compressed natural gas (CNG) into one of the production tube or the well casing;

determining when the CNG has displaced sufficient liquid in the production tube or well casing for the CNG to reach the valve positioned directly below the topmost valve at which point closing the topmost valve by reducing the pressure of the control fluid below the pressure where the topmost valve closes but keeping the pressure above the pressure where the valve positioned directly below the topmost valve closes.

17. A method for operating a gas lift system for lifting oil for use with a production tube positioned inside a well casing with a plurality of manifolds in the production tube space apart along the production tube, the method comprising:

coupling a valve to each of the plurality of manifolds, wherein each valve comprises:

a valve body that contains the valve;

a mounting body rotatably coupled to the valve body, wherein the valve body extends through the mounting body;

a member that is movable within the valve relative to a seat, wherein the position of the member defines an adjustable restriction to fluid flow through the valve;

a biasing device that pushes the member in a first direction that reduces fluid flow through the valve;

a pressure chamber and a piston, wherein pressure in the pressure chamber pushes the piston and the member in a second direction opposite the first direction which increases fluid flow through the valve, wherein, absent sufficient pressure in the pressure chamber, the biasing device closes the valve;

coupling a pressure control device to each of the pressure chambers through each of the mounting bodies with a single control line;

positioning the production tube inside the well casing;

with oil filling both the production tube and the well casing, setting the pressure produced by the pressure control device to a pressure greater than required to open each of the valves;

with oil filing both the production tube and the well casing, injecting compressed natural gas (CNG) into one of the production tube or the well casing;

determining when the CNG has displaced sufficient oil in the production tube or well casing for the CNG to reach the valve positioned directly below the topmost valve at which point closing the topmost valve by reducing the pressure of the control fluid below a first pressure where the topmost valve closes but keeping the pressure above a second pressure where the valve positioned directly below the topmost valve remains open.

18. A valve for use in a remotely actuated gas lift system for use with a production tube positioned inside a well casing with a plurality of manifolds in the production tube spaced apart from each other along the production tube, wherein the valve is controlled using a control line positioned inside the well casing, wherein the control line caries a control fluid; the valve comprising:

a valve body;

a mounting body rotatably coupled to the valve body, wherein the valve body extends through the mounting body, wherein the mounting body is adapted to couple to the control line;

a valve seat;

a valve member that is movable within the valve body relative to the valve seat, wherein the position of the valve member relative to the valve seat defines an adjustable restriction to fluid flow through the valve body;

a coupling means for connecting the valve body to one of the plurality of manifolds;

a valve piston positioned within a control fluid chamber within the valve, wherein changing pressure of a control fluid in the control fluid chamber moves the valve member relative to the valve seat; and

a first inlet for fluidly coupling the control line to the mounting body;

a second inlet to the control fluid chamber, wherein the second inlet is in fluid communication with the first inlet and wherein the second inlet is rotatable relative to the first inlet.

19. The valve of claim 18, further comprising an outlet in the mounting body for fluidly coupling the control line to another valve.

20. The valve of claim 19, wherein the mounting body defines a fluid path between adjacent valves that does not include the valve that passes through the mounting body.

21. The system of claim 1, wherein the mounting body defines a fluid path between adjacent valves that does not include the valve that passes through the mounting body.